SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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EMPTY CRADLE CLOTHES

A Familiar Midsummer Sight

(See page 76)

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Huge New Geyser in Yellowstone

Geology

A new geyser of great magnitude, whose volume of water discharge is greater than any other known in Yellowstone National Park since Excelsior Geyser stopped playing in 1888, has broken out in the Fairy Creek section of the Lower Geyser Basin of this great region of thermal phenomena.

The new geyser has been investigated by Dr. Arthur L. Day, director of the Geophysical Laboratory of the Carnegie Institution of Washington, and Dr. Eugene T. Allen, who has been field representative of the geophysical department of the Carnegie Institution here for the past two years.

This huge geyser has a crater of roughly circular form, with diameters of 100 and 120 feet. It erupts twice in 24 hours, and each eruption lasts three hours or longer. The geyser continues to spurt at intervals of from 15 to 20 seconds during its period of eruption, bursting forth from a quiet surface with a loud explosion and throwing a column of water to an average height of 60 to 75 feet, with occasional spurts of 100 feet in height, from a crater eight feet in depth.

The outlet of the geyser crater is four feet wide and during the period of eruption a stream of water eight inches deep flows through it at the speed of 120 feet per minute, giving this geyser by far the greatest water discharge of any in Yellowstone Park. The outlet stream does not receive water from any source other than the geyser. The eruption ceases without warning, and the final outburst seems just as violent as the first. The crater then drains and with the exception of a small fissure ten feet long and three feet wide, elliptical in shape, and several boiling mud springs along the north edge, is entirely dry.

The outer edge of the crater shows a top layer of siliceous sinter about two feet through and under this a wide layer of black sand and hardened clay. The main orifice or fissure through which the principal action comes is lined with sinter.

The action of this geyser is so violent, its eruptions of such magnitude and its intervals of eruption so regular that it bids well to become one of the park's major attractions. It is the largest geyser to be discovered in modern times in the park.

The geyser is yet unnamed and but two parties of explorers have visited it since its discovery. Superintendent Horace M. Albright, Dr. Day and Dr. Allen have made a study of the new phenomenon.

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Dog-Day Cicadas

Entomology

"Creeeeee-eee-eee-eee!" sings the dog-day cicada in the tall poplar. And "Crrreee-eee-eee-eee!" answers another from across the simmering fields.

"Six weeks till frost," prophesies the weather-wise oldest inhabitant; "The locusts are singing."

It may be six weeks, or more, or less, until frost. But a locust the creature is not. A locust is a kind of grasshopper, and the cicada is a true bug, that is, an insect with a long piercing beak instead of chewing jaws.

The dog-day cicada is a relatively long-lived insect. He exists as a grub or larva in the ground for two or three years, sucking the juices from the roots of plants. When he reaches maturity he tunnels to the surface of the ground, and some day, when there is no threat of rain in the air, he comes out, crawls up the trunk of a tree, and emerges from his shell as a fully formed winged insect.

The cover picture shows on a large scale one of these empty shells, where its former tenant left it clinging to the rough bark of a tree. Note especially the little pouch along the side, in which the insect's wing was packed away, tightly folded up. The really crucial affair in the cicada's emergence is the correct extrication, unfolding and drying of its wings.

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In This Issue—

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"Osmics", the Study of Odors

Physiology

Who will found a science of odors? Dr. N. E. McIndoo, of the U. S. Bureau of Entomology, himself an expert on odors, presents the claims of osmics as a possible new science and engages in lively defense of the humble faculty of smell.

"Our lives," says the scientist, "are frequently saved by our noses, yet we hold their service in disrepute. They warn us against the presence of poisonous gases, reveal the existence of foul places where disease germs breed, aid physicians in conducting of diagnosis, chemists in making an analysis and may even help plumbers locate leaks.

"They are responsible also for a great deal of pleasure. It is the appetizing odor of food, rather than its taste, that pleases, the bouquet of rare wines. The sense of smell is the basis of a great industry, the manufacture of perfumes, which can be compared to the telephone, radio, and phonograph industries, based on the science of acoustics, or the motion picture industry, based upon the sense of sight and the science of optics."

The late Alexander Graham Bell; Kenneth, a Scottish professor at the University of Edinburgh, and the chemist, Hendrick, have been enthusiastic promoters of the new science. In view of the increasing importance of odors in the world of scientific experimentation and in medicine, Dr. Bell prophesied that some day, someone will "measure the difference between one smell and another." Hendrick predicted the founding of a special "Institute of Osmics," where research could be coordinated.

The staff, he says, would comprise at least a physiologist, psychologist, chemist, zoologist, botanist, anthropologist, rhinologist, and statistician, also the services of an embryologist, a geneticist and a paleontologist. Without committing himself quite so definitely, Dr. McIndoo agrees that more cooperation between the various groups of scientists interested in the subject is absolutely necessary before the science can be founded.

Referring to the nose as "the Cinderella of our organs," Hendrick philosophizes thus upon the scorn accorded its services and finds that the ancient Arabs actually exploited the sense of smell:

"Was it some sainted anchorite," he muses, "or some other enthusiast of imagination and influence, who found the use of the human nose to be dangerous to the soul? We do not know, but in some way or other the conscious exercise of the nose became taboo and this entered into the folkways. It has ceased to be a sin, but it remains an impolite topic.

"The Arabs, in their days of glory, were not ashamed of their noses and planted scented gardens, wonderfully devised, so that he who walked through them, or whiled away an hour there, might rejoice in a cultured delight in odor. They were so arranged that at the entrance the olfactory sense would be struck by a pervading and strong smell, not necessarily of a pleasant nature. From this the path would lead gradually through less coarse fragrances to those more delicate, until at the end there would be reached an odor of exquisite quality which only the cultured nose could appreciate."

Scientifically speaking, the sense of smell has proved of increasing value and its usefulness is coming more and more to be recognized. Manufacturers of illuminating gases, which may be inodorous, add odorous impurities to them as a safeguard against poisoning through carelessness.

Use of the sense of smell may be considered of medico-legal importance, since certain diseases have characteristic odors and in practising medicine doctors are using their noses more and more as an aid in diagnosis. Bacteriologists identify by their odors different cultures and chemists are constantly using their olfactory sense as an aid in analysis.

In the field of industry and agriculture, the sense of smell is being very definitely exploited. Leaks in boilers and pipe lines are detected by mixing oil of peppermint or wintergreen with the water or air that is forced through them; then smelling at the cracks and joints. A more accurate method, says Dr. McIndoo, is to use catnip oil and let a cat locate the leak. Experiments also have been conducted in the use of odors as warning signs in mines.

Trading on the insect's sense of smell, infinitely more acute than that of any animal or human being, entomologists have been able to control certain pests through the use of attractants and repellents. The problem is to find a food that will prove more attractive to the insect than the plant attacked, or some material whose odor is distasteful enough to drive him off.

Effective warfare has been waged against grasshoppers, notably in Western Canada, through the use of such an attractant. The "ammunition" consisted of literally tons of bran, sawdust, molasses, lemons, arsenic, Paris (*Turn to next page*)

THE SQUARE OF CLOTH HAS BEEN SATURATED with geraniol, an attractant for Japanese beetles, and the odor has lured the pests to their doom. The peach tree near by, upon which they are feeding, has been generously sprayed with poison

"Osmics"—*Continued*

green and amyl acetate, nicely mixed—a concoction that lures them to their doom. Poisoned bran baits are also used to control army worms, cutworms, crickets and earwigs, saving farms millions of dollars.

Ants, notoriously, are fond of sweets but are very exacting in their tastes. The highly destructive Argentine ant, which threatened Mississippi in 1922, had been almost eradicated four years later by the use of an attractant containing honey, sugar, water, sodium arsenate, tartaric acid and benzoate of soda. In preparing this bait vessels and utensils must be scrupulously clean. The ants will not touch it if it becomes accidentally flavored with an undesirable substance.

The olive fly, worst enemy of the olive tree, responds to a mixture of water, molasses and sodium arsenate, used as a spray. Other flies such as the Mediterranean fruit fly and the melon fly are being controlled to a certain extent by similar baits and work is now being carried on with houseflies and destructive moths and beetles, notably the codling moth, which causes wormy apples, and the Japanese beetle, which seems to like geraniol.

Moth balls are a repellent familiar to everyone. So is citronella, used as a mosquito chaser. Repellents are used in controlling other insects also but are not considered as effective as attractants.

In spite of these discoveries, which demonstrate conclusively the practical value of research along the olfactory line, a great deal of additional work will be necessary before this sense can be exploited fully. As facts are brought out one after another, there is being builded gradually a bona fide science of osmics. Classification of odors has been advanced to the point where certain cousinships are recognized, but it is not known yet just what an odor is.

It is of primary importance to ascertain whether, like sound, it is a vibration and capable of being reflected or whether it is an emanation that can be weighed. Fundamentally, smell is still as much of a mystery as electricity.

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The attempt to renew youth of horses by transfusing blood from a young horse into the bloodstream of an old horse was made during the seventeenth century.

Experiments indicate that X-rays may be used to detect dangerous weakness in trees that appear sound on the surface.

A ton of wheat takes from the soil about 47 pounds of nitrogen, 18 pounds of phosphoric acid, and 12 pounds of potash.

Many jewelry firms test suspected diamonds under ultra-violet light, which makes the real gems glow, while imitations appear lifeless.

Norway is to have a floating fish-meal factory which will cruise along the coast and gather up fish scraps from factories to make meal.

Nile Swimmers "Crawled"

Archæology

The "modern" crawl stroke recently adopted by European and American swimmers was nothing new to the Egyptians 3,000 years ago, according to Prof. James E. Dunlap, of the University of Michigan, writing in *Art and Archæology*.

Study of ancient mosaics and vases has convinced Professor Dunlap that overhand strokes were practiced by swimmers of Egypt, Rome, and Greece. The Assyrians appear to have been less at home in the water. In one scene of Assyrian soldiers crossing a river, two of the three soldiers stopped to blow up inflated skins, so that they would have support. Clinging to the long, balloon-like skin, the soldier pushed back and down with his (*Turn to next page*)

Germs To Fight Borer

Bacteriology

A near relative of the silkworm disease which caused the famous Pasteur much grief, but also brought him much fame, is being studied in France as a possible ally in the war against the corn borer.

It is known that insects suffer from a multitude of diseases, many of which are epidemic and destroy large numbers, but the practical applications of insect pathology present an almost unexplored area of science. Insect diseases, like those of man, are usually caused by microbes such as bacteria, fungi, or the ultra-microscopic group of viruses.

Dr. A. Paillot, in a paper presented at a recent meeting of the French Academy of Science, reported the discovery of two new protozoa or single-celled animals which are parasites of the European corn borer in certain parts of France. One is a flagellate and propels itself forward and backward with a nearly ultramicroscopic whip-like appendage. It is quite rare and is found occasionally in the internal organs of the corn borer larva.

A more promising disease is a microsporidia to which Dr. Paillot proposes to give the name *Perezia pyrausta*. It spreads decidedly in an epidemic fashion, and has been observed frequently in two regions of the Jura.

Dr. Paillot says that externally the sick corn borer larvæ do not differ from the healthy larvæ, but that internally they are pretty badly wrecked. The disease is transmittable from individual to individual through the intestinal tract.

Keeping Cool A Science

Physiology

Keeping cool is really a science, but one which the everyday man can practice. Many of the customs we follow in our struggle to beat the temperature have a scientific background, though few of us realize it. For instance. we instinctively wear loose, porous clothing, and not too much of it, knowing that we feel cooler so.

The reason is that such clothing allows the heat generated in our bodies to pass into the air away from our bodies. For it is not a question in hot weather of how to keep the heat out but of how to get the heat out.

No matter what the weather, we have to keep our body temperature at normal. In cool weather the heat passes from a higher to a lower temperature as easily as water runs down hill. When the temperature around our bodies gets as high as the temperature inside them, it is difficult to get rid of the surplus heat of our bodies.

One way to do this is to keep the body from making much heat by eating very little food, especially those foods that have a high fuel value and make the body fires burn faster and hotter. Such foods are sweets and starches and proteins, which the dietitians call high-calory foods.

Another way of keeping cool is by perspiring. Water can carry more heat without showing it than anything else in the world. Of course, we must drink plenty of water, in order to replenish the supply in our bodies. People who do not perspire much will be more comfortable in hot weather if they drink hot tea and coffee rather than the iced variety, as the warm drinks will induce extra perspiration.

If you sweat a quart of water you have gotten rid of about 500 calories of heat. But if the air already holds all the water it can take up, you cannot get cool by sweating off the heat, which is why a muggy day with high humidity is so uncomfortable. On such a day you must drive the hot, moist layer of air away from your skin, using a fan if there is no breeze available.

Of course, everybody drinks more water during very hot weather, but if just a pinch of salt is added it will help greatly toward enduring the heat.

Scientists investigating conditions in hot coal mines and steel plants found that the workers who succumbed rapidly when working in a temperature of about 100 degrees, were able to stand it better when this small amount of salt was added to their drinking water.

At high temperatures, especially when working hard, the body gives off large amounts of water in perspiration. This is Nature's way of keeping us cool. But our bodies also lose much salt with the perspiration, which is what causes a large part of the physical exhaustion felt when working in hot weather. To overcome this add a pinch of salt to your drinking water.

Ice Cakes Standardized

Home Economics

Now the ice cake that meltingly does its part in combatting summer heat is to be standardized. The U. S. Bureau of Standards has issued standard weights and maximum sizes for the chunks of frozen water that the ice man puts into the refrigerator daily. Cakes of 25, 50, 75, 100 and 150 pounds are declared standard and for these weights maximum dimensions are specified. The smallest weight, 25 pounds, must measure less than 12 by 12 by 8 inches, while the 150 pound cake must not exceed 12 by 24 by 24 inches. Manufacturers will shape the ice compartments of refrigerators so that the standard cakes will slide into them easily.

Army To Test Explosive

Chemistry

The region of Fort Humphrey, Virginia, will echo to the explosions of radium atomite, new explosive claimed to be more powerful than T. N. T., some time this month. According to the office of the Chief of Engineers, of the War Department, Major William H. Lanagan, of the Board of Engineer Equipment, has requested such a demonstration. A preliminary test of the explosive invented by Capt. H. R. Zimmer, of Los Angeles, former army officer, was made at Pasadena by Lt. Col. L. M. Adams, of the California Institute of Technology. Lt. Col. Adams reported to the Chief of Engineers, and the board, after examining his report, has decided that the new explosive "appears to have military value."

Degrees in Dependence

Biology

WILLIAM MORTON WHEELER, in *Foibles of Insects and Men* (Knopf):

Parasitism is, of course, a form of "behavior", and may be described as one of several complex types of the reactions of organisms to the most important source of their energy, their food supply. Other reactions to this element of the environment are predatism, commensalism, scavengerism and mutualism. There is in the main sufficient consensus of opinion concerning the distinctions between these different phenomena. Predatory animals kill other animals and devour them wholly or in part. Parasites put other organisms in the position of "hosts" by living *directly* on their tissues in such a manner as not to cause their immediate death. The parasite thus draws *indirectly* on the food supply of another organism by permitting or compelling it to do the hard work of procuring the food and of converting it into much more accessible and more easily assimilable compounds. The parasite may be said, therefore, to use its host as an instrument not only for procuring, but for predigesting, its food. The commensal also uses another animal as an instrument, but merely in gaining access to a food supply which the latter has procured but has not yet assimilated. The scavenger, like the saprophyte among plants, may be described as a parasite of the dead, deriving its sustenance from decompositing animals or plants or from the excretions of the former. The mutualist, finally, as the name implies, lives in a condition of balanced energetic or nutritional cooperation with another organism.

Of all these types of reactions to the food supply, parasitism is far and away the most prevalent; so prevalent, in fact, that it may be doubted whether there is any animal that does not resort to it, at least during a brief portion of its life, even if this be only during the period when, as an egg, it is drawing its supply of food-yolk from its parent. That parasitism has been most frequently developed from predatism is certain, that it may occasionally have its origin in commensalism, mutualism or scavengerism is highly probable, that it can, especially when it affects a considerable portion of the life-cycle, develop into anything but a more extreme form of parasitism, is very doubtful.

It would be easy to show by the citation of many examples that parasitism is an extremely protean phenomenon, one which escapes through the meshes of any net of scholastic definitions in which we may endeavor to confine it. Nor is this surprising when we stop to consider its great prevalence and the fact that during the course of time the organic world, *pari passu* with its increasing differentiation, has become ever more and more heavily weighted with parasitism and mutualism.

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The airplane carrier Saratoga can carry 83 planes.

The porcupine's quills help to keep him afloat in the water.

American population in China has fallen off more than 3,000 in the past three years.

The art of weaving carpets is handed down from mother to daughter through many generations in Turkey.

It is believed likely that the top of Mt. McKinley, almost four miles above the sea, and frozen by the long northern winters, may be the scene of the world's lowest temperature records.

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Nile Swimmers—*Cont'd*

free hand and so propelled himself across.

That the Greeks used the overhand stroke is shown by a vase depicting a scene in a women's bathing establishment. One of the women is swimming with her right arm extended forward to begin the downward and backward stroke, and her left arm is near her side at the end of a stroke. Two of the other Greek women in the picture wear bathing caps, but bathing suits were thought unnecessary.

Swimming instructors were known upon the banks of the River Nile at a very early date, Professor Dunlap points out. A nobleman of Egypt, who lived before 1800 B. C., recorded proudly that his children and the children of the king took their swimming lessons together.

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Woods Hole Rimes

(*From the Woods Hole Song Book*)

The Gull

The graceful gull is not content
On furnishing an ornament,
As thru the air he floats and sweeps,
He dreams of fishy food and sleeps
When his large appetite is dulled
So don't you let yourself be gulled.

The Nereis

The Nereis, the Nereis
By moonlight grows delirious,
It fills the sea with progeny
Now isn't that mysterious?

The Sea Urchin

To my peaceable existence
The biologist a menace is,
He takes my eggs to study
Artificial parthenogenesis.

The Sea-Cucumber

Beneath the waves the sea-cucumber
Spends all his hours rapt in slumber,
And he does not appear to see
The fine aquatic scenery.
It seems to me he spends his day
In a most slow, cucumbrous way.

The Squid

The squid, he swims from head to tail,
He blushes when he is pale,
If you attack he will sink
And screen himself with sepia ink.

The Sand-Dollar

The sand dollar is such a good financier
He deposits himself in a sand bank, it's clear,
That this is a simple, methodical way
Of saving himself for a rainy day.

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Skull Promises Geological Upset

Palæontology

Radical changes in our ideas of the course of events in recent geological time—say the last half million years or so—may be brought about by the discovery in Utah of the unfossilized skull of an extinct camel, with a bit of dried flesh still clinging to the bone. The relatively fresh condition of the specimen argues that its one-time possessor died only a few centuries or millenia ago; present ideas hold that this particular sort of camel became extinct a half-million years ago. If this camel really died so long ago, the bone should have been largely or wholly replaced by stone, and there should have been no flesh on it at all.

The find was reported by Prof. Alfred S. Romer of the Univer: ty of Chicago. The skull was sent to him by Prof. A. L. Mathews of the University of Utah for examination.

Prof. Romer's first guess was that it might be a relic of a herd of dromedaries imported into the Southwest during the 1870's, as an experiment which terminated unsuccessfully. But a critical examination of its anatomical details showed many points of close resemblance to the skulls of very ancient extinct American camels, and marked differences from those of existing Asiatic and African forms. In his opinion the animal belonged to the genus *Camelops,* which is supposed to have been extinct for at least half a million years.

The skull was found by two high school boys of Fillmore, Utah, while exploring a lava cave some twenty miles southwest of their home. Two hundred feet back in the cavern they found the camel's bones buried under several feet of fine dry windblown deposit. This region has scanty rainfall, but is not a real desert. The riddle of the camel's preservation is thus heightened, for while flesh becomes dried and mummified in a complete desert, it is subject to decay where there is even a little moisture.

PROF. ROMER with the cranium of the extinct camel from Utah. Shreds of dried flesh clinging to the bone may force radical changes in palæontological doctrine.

Prof. Romer's tentative answer to the riddle is not that the skull has remained unfossilized, yet undestroyed, for half a million years, but that the species did not become extinct then, surviving instead until comparatively recent times.

Such an answer, he points out, would also help to settle the conflict over the antiquity of man in America. Many scientists refuse to accept as authentic the occasional finds made on this continent of stone or bone implements associated with the remains of animals supposed to have been extinct for hundreds of thousands of years. Prof. Romer states that other recently discovered remains of camels, lions and other animals in the West also hint at a longer survival of these extinct beasts than has hitherto been supposed.

The new-looking cranium is not entirely without scientific precedent.

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Potato-Tomato Gives Double Crop

Agriculture

A "good graft" (not of the political variety) which anyone may try, and which will reward a little patience with a double crop, is described in a recent bulletin of the Missouri Botanical Garden. It consists of a tomato vine grafted on a potato stock, which yields tomato fruits above and potato tubers below. The graft is fairly easy to make, it is stated, requiring no more skill than is needed for a similar operation on an apple twig. Apparently the first one on record was made over a century ago by an amateur scientist named De Tchudi, who reported his experiments to the Horticultural Institute at Fromont in France.

Neither partner in this double plant body seems to have any influence on the other. The tomatoes are like those of sister plants grown on their own roots, and the potatoes differ in no way from those grown in the ordinary way from other eyes cut from the same parent tuber.

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Insects Need Vitamins

Physiology

While new facts about the vitamins necessary for the health and happiness of the human race come to light nearly every day, entomologists have been endeavoring to find which, if any, vitamins are needed to keep up the health and morale of the insect world.

The subject of the investigation into insect vitamin lore selected by Dr. Charles H. Richardson, of the U. S. Bureau of Entomology, was the Mediterranean flour moth, a well known pest of the flour mills that passes most of its existence gorging on flour. Since the wheat kernel from which flour is made is an important source of vitamins A and B it was thought that this would be a good type of insect with which to obtain a quantitative check-up on the proportion of vitamins necessary for insect welfare.

In whole wheat flour the larvæ of the moths lived and flourished happily but in the same kind of flour from which a substance believed to be vitamin A was extracted by chloroform, relatively few larvæ developed into full grown moths. In highly milled flour, from which much of the growth-promoting vitamin B is removed by the processes of manufacture, the growth rate was also poor. With the addition, however, of small quantities of yeast, a rich source of vitamin B, the number of larvæ that reached maturity increased.

According to these results obtained by Dr. Richardson, the reaction of the flour moth toward vitamins A and B checks very well with the requirements of laboratory animals and human beings. Further studies on this problem with other insects, the entomologist pointed out, will be of great interest from the point of view of comparison of insect physiology with that of higher animals. Practically it will affect the control of insect pests since any factor that might render poisoned bait for harmful insects more attractive would assume great economic importance.

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The Royal Danish research ship, Dana, has begun a two years' cruise around the world to study oceanography.

The largest collection of medical books in the world is at the Surgeon General's Library at Washington, D. C.

The Relation of Biology to Physics

THOMAS H. MORGAN, in *Bulletin of the California Institute of Technology*:

I should like to illustrate the need of physical knowledge in biological work by a few very simple examples which, in a general way, are familiar to you, yet will serve, I hope, to bring home the need for the cooperation for which I am pleading.

The egg is a cell, and the first step in development is taken when the egg divides into two parts. Cell-division is one of the most general phenomena of living things. The first indication of division in a living egg is a constriction that appears on the surface, which gradually spreads and encircles the egg. It cuts into the interior until two hemispheres result that flatten against each other. After a pause of less than an hour, a new division appears at right angles to the first, dividing the material into quadrants.

This process continues until a thousand or more cells may be produced before any of the embryonic organs are laid down. Our microscopes reveal, even in a transparent egg, only a small part of what is happening inside the egg. By means of an elaborate technique the interior changes have been made out. This technique consists in staining the substances of the egg in various stages of division. The exploration of the interior is further carried out by cutting the egg into hundreds of thin slices—as many as five thousand to an inch. Such sections show in the middle of the egg an inner sphere, or nucleus. The walls of the nucleus dissolve just before division is to take place, and a number of tiny rods or chromosomes reveal themselves. There is a characteristic number of these for each species of animal or plant. Moreover, they often differ in shape and size. Whenever differences are present we find that there are two chromosomes of each size or shape.

The next step is the appearance of a spindle-shaped figure near the chromosomes. Into the middle of the spindle the chromosomes move, or are carried, and there they arrange themselves in an equatorial plate.

Even before this time we discover a clear line running through the length of each chromosome. Each has split throughout its length and two daughter halves are present.

Each half of each chromosome then moves to one pole and its sister half to the opposite pole.

It is about this time that the constriction appears on the surface of the egg. As it deepens it cuts through the middle of the spindle separating the daughter chromosome groups from each other.

Around each group of chromosomes a fluid accumulates, and the chromosomes begin to lose their staining property. Suitable stains reveal that each choromosome becomes branched and the branches have the appearance of forming a network in the new nucleus that is now formed.

A resting stage of about half an hour follows, and then the same process repeats itself—the nucleus wall in each cell disappears, the chromosomes reappear, a spindle develops, the chromosomes again split lengthwise into daughter halves.

I have given the briefest outline of the process of cell-division that is described in every textbook of biology. What does it all mean? What, to begin with, causes the constriction to appear on the egg at the moment when the chromosomes have alredy divided and separated? The division of the cell impresses us as a simple physical phenomenon. Many attempts have been made to account for it, but none are satisfactory, because, I think, we do not know as yet enough of the physical constitution of the materials of the egg to permit more than provisional guesses.

This, however, is only the first problem that presents itself! What makes each chromosome split lengthwise? The chromosomes are too deeply imbedded in the egg for us to invoke external agents. It must seem that some sort of a molecular event is taking place, whose nature is entirely unknown to us, and yet, who will doubt that it, too, may be a very simple physical process?

How do the chromosomes reach the equator of the spindle? What moves the daughter halves to opposite poles? When they reach the poles, why do they undergo a reverse series of changes and pass once more into a resting stage? What are they doing while resting? Probably each is growing to its original size, but what is the nature of this growth? Here we meet with a dozen questions, all calling aloud for answers. It seems that no one but a physicist can hope to solve them.

There is another important question connected with the chromosomes for which we have no answer: I refer to the union of conjugation of the chromosomes that takes place once, and once only, in the cycle of the life of each individual organism.

When the germ-cells, that is, the egg-cells and the sperm cells, after having passed through many ordinary divisions (such as I have just described), reach their final stage of maturity a strange thing happens. Although the chromosomes have remained apart through a long series of cell-divisions, now they come together in pairs.

The two members of each pair approach each other and come to lie side by side. It looks as though they had fused and reduced the visible number of chromosomes to half the original number. But we have many reasons for thinking that they do not fuse but only lie closely apposed.

There is another fact connected with this union of like-chromosomes that was at first wrongly interpreted: One member of each pair has come from the father of the individual, the other from the mother. It was supposed, wrongly as I have said, that the conjugation of the chromosomes had something to do with their origin—in a word, that they mated because one had come from a male, the other a female.

Now we know that this is not the cause of their union, but that they mate because they are like each other—in fact, they may be identical. Here is a fine opportunity for metaphysical discussion, but I like to think rather that the event is purely physical, even although I must confess that we do not know what kind of an attraction draws like-chromosomes together, and not even if it is an attraction.

Science News-Letter, August 11, 1928

A European invention is an alarm clock which wakens a deaf sleeper by bouncing a rubber ball on him.

Pecos, one of the largest pueblos in the southwest, was founded about 800 A. D. and was occupied for about 1,000 years.

Volcano Active After 28 Year Rest

Volcanology

Mayon, the volcano that has destroyed the coast town of Libog, and several neighboring villages in the Philippines, has aroused itself after a slumber of twenty-eight years. The eruption has not come as a surprise to students of volcanoes, because although quiescent, it was known to be active. During the nineteenth century 26 eruptions occurred, with especially violent ones in 1814 and 1897.

The Philippines boast a dozen volcanoes that are classified as active, but eruptions of most of them are rare. Mayon, and its neighbor, Taal, both of which are in South Luzon, are the most energetic of the lot, though no severe eruption of Taal has happened since 1754.

When Mayon erupted in 1897, the circumstances must have been very similar to the present one. That of 1928 began on June 21, while the one in 1897 started without warning on June 23. By the next day it began to excite alarm, and on the day after that began its work of destruction. Lava flowed down the side and for seven miles to the east; volcanic ash was rained over the surrounding country for 100 miles to the east and 75 miles to the west. Finally, by June 30, the volcano was again quiet. The next eruption was in 1900, and since then it has been inactive. Even the fiery glow which its vapors gave forth at night for centuries has been absent in recent years, but volcanologists have learned by experience that such a thing can occur without indicating that the volcano has retired for good.

Mayon forms a picture of a typical volcano. It is nearly 8000 feet high and rises from the plain to form a perfect cone. The circumference of its base is about 120 miles.

Altogether there are several hundred active volcanoes scattered about on the earth's surface, their eruptions are quite independent of each other, in the opinion of volcano experts, and all are intermittent in their action.

When Krakatoa, near Java, erupted in 1883, it did so after two centuries of dormancy. One famous Japanese volcano, Bandaisan, which went off with particularly great force in 1888, was quiet for over a thousand years, so it seems that volcanoes erupting after long inactivity are apt to be unusually severe.

As a contrast to these volcanoes there stands Stromboli, in the Mediterranean, known to mariners as the "lighthouse". For two thousand years it has been continuously, though moderately, active.

Science News-Letter, August 11, 1928

Canada Has 15,000 Bison

Zoology

Buffalo ranching has been a decided success, as carried on by the Canadian Government. This year's quota of American bison, 1,057 animals, have just been transferred from the government ranch at Wainwright, Alberta, to Wood Buffalo Park, near Ft. Smith, Northwest Territories. This reduces the Wainwright herd to about 5,000 head, and brings the total shipments into the Park to over 6,000. In addition, there is a herd of some 1,500 "wood buffalo" who were native to the Park, so that taken altogether the bison now under Dominion protection in the two places number well over 13,000.

The Wainwright herd traces back to four calves, survivors of the wholesale slaughter of the vast bison herds that roamed the western plains during pioneer days. Michael Pablo, a half-breed American Indian in Montana, adopted the calves and with them as a nucleus built up a herd of some 700 animals. In 1907 he sold them to the Canadian government, and they were transferred to the fenced range at Wainwright.

In the 21 years since then the 700 bison at Wainwright have increased to over 15,000. Those not accounted for in the two major herds at Wainwright and Wood Buffalo Park have been distributed to other parks or otherwise disposed of. Some of the surplus animals have been killed for meat and buffalo robes.

Science News-Letter, August 11, 1928

Babies May Remember Experiences

Psychology

An adult who relates strange things that happened to him in the first years, or even the first days, of his life, may be remembering the actual facts, in the opinion of J. A. Hadfield, psychologist at London University.

People who apparently recall events out of a supposedly blank babyhood are noted from time to time by psychoanalysts, as they probe into the early years of life in search of the root causes of maladjustments. Such stories have often been taken with a grain of salt by the individual's family, who believe that these must be merely imaginative memories that have come to seem real to the individual. It is also possible that the individual's "memory" of an event was gained in perhaps his third or fourth year of age, from hearing someone else recount an incident of his babyhood.

Describing a number of cases in the British medical journal, *Lancet*, Mr. Hadfield tells of a doctor who remembered a fire that occurred when he was eight months old. The fire completely destroyed the house and no pictures of the home were preserved. The doctor described the circular staircase and a colored glass window at the landing, and the flames licking at the glass panels. When he was about seven years old he had told his parents about this memory, and gave so many details that they accepted the story, incredible as it seemed to them.

A more remarkable instance cited by Mr. Hadfield is that of a woman under hypnosis who vividly described the terrifying infantile experience of being slapped, held upside down and shaken harshly. The psychologist inquired if she did not know how they revived infants when they do not breathe after birth. She answered that she had no idea, and was surprised to hear that she had described the usual procedure.

Undoubtedly young children are too young to understand the whole significance of their experiences, Mr. Hadfield comments, but they "are not too young to feel, and experiences that are not in the least understood by a child may produce violent commotion in its soul."

Studies of anatomy, he states, show that in the year-old child the brain center for emotion is active, though the center for more discriminative thought is probably not in full function.

The young child, he suggests, can hold in its memory the feeling of a scene, and later when he can use language he puts the feeling into words more or less accurately as the case may be.

Science News-Letter, August 11, 1928

Selecting Research Man

Psychology

EDWARD R. WEIDLEIN, Director of the Mellon Institute, in *Value of Organized Scientific Research* (American Management Association, New York):

Our method of securing men has been built up over a period of years. We have established contacts with all of the universities throughout the country. . . . Whenever these universities have a man who they feel is like some other man they have developed, who has real research ability and a personality (which is very important because these men come in contact with executives, and it is just as important as their knowledge of the fundamentals of science), they write in to us and tell us of this particular man. We then get his complete history. Integrity in a research man is very important. We go back and find out something of his early life, training, home surroundings, letters of recommendation, etc. We get his photograph and then we have a personal interview with the man.

I have a very large office in the building, and I can almost tell by the way a man walks in that door, whether he is the type of man I want in our organization. I can tell by his characteristics, mannerisms — everything else, a sort of thing that has been developed over a period of years.

There was one man who walked into my office from a Middle Western university. He came to me most highly recommended. That man walked in and as he opened the door I thought, "I am not going to judge right away, but he is not the type of man I want." We talked and he developed a characteristic manner, as some will, and soon satisfied me he would not co-operate with anybody. The fellow went away feeling quite sure he was going to land the position because he had such high recommendations all the way through.

I sat down and wrote him a letter and told him exactly what impression he made on me. Within a month he wrote back and said that he appreciated what I said, that he had several people turn him down and he had taken what I told him to heart, and was going to change his ways.

I do not care how good a man is—a research man or any other man, if he cannot co-operate, he is not the type that will fit in any organization. He will do more damage than good. It is a motto we have in our own organization right straight through. A man who will co-operate is a man worth while; he will get his just rewards and does not need to worry about the selfish petty things.

If anybody asked me what is the success of our organization, I would say it is having been successful in selecting men. It is the men that make an organization what it is.

Science News-Letter, August 11, 1928

Flies have a tendency to go toward the light, and fly traps should be set accordingly.

Iceland will celebrate the one thousandth anniversary of its government in 1930.

Corkscrew curls were popular in Roman hairdressing in the first century A. D.

Mount McKinley, which is 20,300 feet high, is the only high mountain so far from the Equator.

The new Bellefonte airway station in Pennsylvania will furnish aviators with a 24-hour weather-reporting service.

The Origin of Soda Water

Chemistry

By Edwin E. Slosson

It is the custom to call upon the school children of the country to contribute to memorials and monuments and movements of any sort which somebody else wants to have helped along.

Now if I should ever start a school subscription it would be for something really popular among the pupils. It would be for a monument to the inventor of soda water, and it would not be a dusty bronze statue over a dry marble basin, but a fountain in every schoolroom flowing freely the beverage that carbonates but does not inebriate.

The inventor was the Rev. Joseph Priestley, the discoverer of the chief element in the world, oxygen, and a chemist in whom we take a peculiar interest, for when England got too hot to hold him he sought refuge in Pennsylvania, where his home in Northumberland is a shrine to which American chemists pay pilgrimages. He was triply distrusted and ill-treated in his native land on the grounds that he was a republican, a non-conformist and a chemist, so a mob burned up his home and laboratory in Birmingham.

While he was preaching in a chapel at Leeds he lived near a brewery and so became interested in the possibility of utilizing the gas which came off the vats. When he moved away from this favorable location he had to devise some means of preparing and collecting the incombustible gas, then called "fixed air." This led him to the invention of the pneumatic trough, which is still the main mechanism of the analysis and storage of gases. He also determined the solubility of carbon dioxide and employed it for charging beverages. Perhaps you would like to hear the full title of this epoch making paper of 1772. "Directions for impregnating water with Fixed Air in order to communicate to it the peculiar spirit and virtues of Pyrmont Water, and other mineral waters of a similar nature."

Priestley's experiments interested a Philadelphia physician, Dr. Philip Syng Physick, and he induced a druggist, Townsend Speakman, to prepare carbonated water for his patients. Speakman added fruit juice as a flavor and then and there the soda-water business was born, 1807.

Previous to Priestley only natural carbonated beverages were known but their use goes back to the remotest times, both in beverages charged with carbon dioxide by the fermentation of fruits and grains and in spring waters charged in the internal reservoirs of the earth. Mineral springs have been sought by the sick and suffering in all lands and ages. Wherever in Europe you find springs of carbonated water there you are likely to find the ruins of some Roman city, which probably remains to this day a fashionable resore whether it be called Bath, *Bad* or *bain*.

The effervescence of the waters seemed to cause effervescence of the human spirit for the spa has always been famous for its atmosphere of gayety and these pleasure cities are commonly called "watering places," but could better be called "carbonating places" for water could be had at home but people had to go long distances at great expense in time and money to "take the waters" at the bubbling spring. But now we can get such carbonated beverages at any drug store or grocery store and often in between.

Science News-Letter, August 11, 1928

Flowers Without Soil

Water grown roses and other flowers, said to be more fragrant than those grown in the soil, may be put on the market soon if methods developed by W. F. Gericke, assistant plant physiologist of the University of California Experiment Station, are exploited commercially.

Mr. Gericke, who plants his flowers in jars of water to which have been added the chemical elements essential to growth, has during the last eight months succeeded in growing to full fruition, or bloom, several thousand floral plants comprising about fifty commercially important species.

The method is said to involve a minimum expense. Once set in suitable containers, filled with a nutrient solution, roses, dahlias, carnations and other plants grew and developed normally without the solution being renewed and, in many cases, without even water being added to replace what was absorbed.

Since compounding the various culture solutions requires little time and since little or no attention is required once the seedlings have been "planted" and (*Turn to next page*)

Long Light Waves Needed

Medicine

The red and yellow light rays of long wavelengths are just as important as the shorter violet or ultra-violet rays for normal growth and development, reports Dr. Charles Sheard of the Mayo Clinic.

Dr. Sheard and associates experimented with chickens, exposing different groups of them to sunlight from which the ultra-violet, red-yellow and green-blue rays respectively had been removed by special glass filters. At the same time, all the chickens were fed a diet rich in everything except vitamin D.

When either the red-yellow or the green-blue light was filtered out, the parathyroid glands, which play an important part in the process by which food is transposed into tissue and energy, increased greatly in size in order to maintain normal growth and development.

During the first two months the rate of growth of the chicks was greater under all filters when a small amount of cod-liver oil was added to the diet. At the end of six months' time it was found that the weights of chicks under (*Turn to next page*)

Chara Poisons Mosquitoes

Entomology

Mosquitoes have a hitherto unsuspected enemy in a humble aquatic plant that grows in many parts of the United States. Its name is *Chara fragilis*, and according to Prof. Robert Matheson and E. H. Hinman of Cornell University, who have investigated its properties, it not merely prevents mosquito "wigglers" from growing to maturity in the waters it inhabits but actually kills them.

The two entomologists carried on observations on ponds where the Chara grew, and also planted it in experimental aquaria on which mosquitoes were then encouraged to lay their eggs. The eggs all hatched in due course, but hardly any of the larvæ lived to emerge as a full-fledged insect able to mar the peace of a porch or a picnic.

The specific property that makes Chara deadly to mosquitoes has not yet been discovered.

Borax has had another use added to the long list of things it is good for by Prof. Matheson and Mr. Hinman. They have discovered that a concentration of one and one-half parts in a thousand of (*Turn to next page*)

Getting Down to Skim Milk

Geology—Economics

GEORGE OTIS SMITH, Director of the U. S. Geological Survey, before the Mineral Law Section of the American Bar Association:

In recent years the mineral industry seems to have grown too fast. The American habit of "stepping on the gas" has brought the mineral industry close to the danger line.

We must not make the mistake of interpreting the speeding up of the mines, quarries and wells as a special phenomenon caused by the war demand, for, in the mineral industry as a whole, the postwar growth has been equal to the growth for a similar period of war and prewar years. So long as the supply permits, the consumption of mineral raw materials increases in response to civilization's demands. Agriculture grows only about as fast as population, because the per capita demand for foodstuffs changes in variety only—not in quantity. Mining grows at a far different rate and a rate independent of population, for the demands by civilization for mineral products change in both variety and quantity with every discovery and invention.

In a large way, however, wise public policy has a real concern in the supply of mineral raw materials. This is true not only because the products of the mines are the stuff that civilization feeds on, but also because mining is a process of continuous depletion, whereas agriculture harvests annual crops, and even forestry harvests periodic crops. A Harvard economist has stated the contrast, "Mining typically lives upon its capital; agriculture upon its income." This increasing draft upon irreplaceable mineral deposits, this depletion of fixed reserves, makes a job for the mining engineer, but more than that, it presents a problem to the intelligence of the nation. Minerals are essential assets because they constitute a country's guaranty of future prosperity.

American industry has all the energy of youth, yet with a background of three centuries of colonial and national life we Americans are now mature enough to begin to think in terms of time as well as of space. A nation's greatness can be gaged by duration as well as by area, and a nation's wealth can be measured by its power to last. Prosperity to continue through the centuries is what we must plan for.

The Old World idea of an entailed estate might well be brought over into our thinking of the public interest in natural resources. The vital question for America today is not how many acres of oil fields or square miles of coal beds or million tons of copper ore are there for us to exploit, but rather how long can the present order of things be continued so as to benefit other generations of Americans. Prosperity should fail to satisfy the patriotic citizen unless it is backed up with some guaranty of permanence. To regard ourselves as trustees, possessing the uncounted wealth of America only to be passed on to our successors in interest without unnecessary depletion, is adopting the Golden Rule in perpetuity. Stewardship of that type means the greatest good to the greatest number for the longest time, and that is practical conservation.

As seen by the engineers, the issue of the control of production is truly a national one, not simply the problem of their employers, the mining companies.

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Poisons Mosquitoes—*Con'd*

water is very quickly fatal to "wigglers." The borax seems to hold its larva-killing properties for a long time; one experiment ran from July 25 to September 7 of last year without any signs of weakening at the end.

The two entomologists add, however, that borax should be used only where its possible effects on other animals and on plant life will be of no consequence.

In the course of their experiments they raised large numbers of mosquito larvæ, which had to be fed artificially. They state that they found common compressed yeast, such as goes into the collegiate "double malted," very good wiggler food.

Science News-Letter, August 11, 1928

All the important varieties of wheat now cultivated can be traced back to the wild wheat that still grows on Mount Hermon.

Next to the United States, the country with the most automobiles per inhabitant is Hawaii, with eight people to each car.

Long Light Waves—*Cont'd*

both the amber and blue filters was much less than under the whole of sunlight except in the cases where cod-liver oil was fed. This small amount of cod-liver oil is apparently able to induce normal growth and development irrespective of the presence or absence of any portion of either ultra-violet or visible solar energy.

Without cod-liver oil and on a standard ration, experiments showed that normal growth did not take place unless both the ultra-violet and visible rays of sunlight were admitted.

Science News-Letter, August 11, 1928

When African Bushmen hunted ostriches they would hide behind an ostrich skin and hold the head up on a stick, so as to come near the birds without alarming them.

The United States has found the production of iodine too expensive, though it is estimated that almost five times our consumption of 3,000,000 pounds could be obtained from the kelp along the Pacific Coast.

Flowers—*Continued*

exposed to the proper environment. Mr. Gericke predicts that in the future at least part of the production of flowers for markets and for the home will be in water media.

For the use of home flower growers, tablets or food pills, similar to those now used as a soil fertilizer, could be compounded. These would contain the same elements used for various flowers in the vats and would need only to be dissolved in the proper amount of water.

Generally speaking, this is what flowers are made of: potassium, calcium, magnesium, iron, nitrogen, phosphorus, sulphur, boron, manganese and zinc, absorbed in solution through the roots; and carbon, hydrogen and oxygen, supplied by the air and water.

Science News-Letter, August 11, 1928

Scientists excavating at the ruins of an ancient town in Iraq have unearthed peas, date stones, nuts similar to pistachios, and wheat, all carbonized by fire, but showing the sort of things eaten in the east 3,000 years ago.

Rabies Vaccine Fails

Medicine

The hope that rabies, dreadful disease that makes dogs mad and has the same effect on humans bitten by them, might be wiped off the earth by anti-rabies vaccination of dogs is dealt a severe blow by the statement of H. W. Schoening of the U. S. Bureau of Animal Industry that this vaccination has not proved 100 per cent. effective.

Work has been done at the Bureau, using the method of the Japanese discoverers of the vaccine and also using a vaccine of killed organisms. The results are peculiarly irregular, which is true of all experimental work on rabies, but they indicate that the killed vaccine is not 100 per cent. effective in giving the dogs immunity.

Reports from state and city veterinarians in localities where vaccination of dogs has been practiced show a similar disappointing result. In the case of many dogs which have been vaccinated and have not subsequently developed rabies, Mr. Schoening points out that these are generally pets that are well cared for and not often exposed to rabies.

In communities where compulsory vaccination is in effect, good results have been attained, as evidenced by a reduction in the number of cases of rabies. However, these communities also have compulsory regulations as to licensing, destruction of stray dogs, quarantine and other effective measures against rabies, so that it is difficult to determine what part vaccination has played in the control of the disease.

Figures on the prevalence of rabies in non-vaccinated dogs and the number of persons exposed indicate that the vaccinating which has been done has not been successful in reducing rabies and its menace to human beings.

Science News-Letter, August 11, 1928

Manila Watches Cholera

Hygiene

Preparations are now under way for a fight to prevent a serious outbreak of cholera. Surgeon R. W. Hard of the U. S. Public Health Service, in charge of public health in the Philippines, has cabled the Surgeon General of the occurrence of four cases of cholera in Manila between July 19 and 21. This is the first outbreak of this disease in Manila for some time and all necessary precautions are being taken to prevent its growing to an epidemic.

Science News-Letter, August 11, 1928

Nature Ramblings

By Frank Thone

Natural History

Dog-Days

According to the official calendar of the ancients, today is the last of the dog-days. The Romans reckoned this period as starting on July 9, when Canicula, the Little Dog Star, rose with the sun, and as ending on August 11, when it set with the sun. Due to astronomical changes, this no longer occurs, but the official dates remain as they were under the Cæsars.

However, with all of August and perhaps a couple of hot weeks in September yet to come, there is no good excuse for relaxing your vigilance over your dog's temper, nor yet your care for his comfort. A dog has a sorry time of it in hot weather anyway. Covered with a heavy coat of hair and unable to perspire except on a square inch or two of his nose-tip, he is a regular physiological furnace. You'd be snappish yourself if you were in his skin.

Dogs may literally go crazy with the heat during dog-days, but even if a dog does run amuck and bite somebody, that does not necessarily mean that he has hydrophobia and must be shot. That can not be determined except by bacteriological tests conducted by a competent physician or laboratory scientist. As a matter of fact, dogs develop hydrophobia just about as frequently in January as they do in August. Hydrophobia has no necessary connection with hot weather.

Until cool weather comes, all dogs should be kept muzzled and chained up in as cool and shady a place as possible. They should have plenty of water, and not too much to eat—no meat at all. They should be allowed moderate exercise in the evening, and should get a few kind words and pat on the head several times a day. Then dog-days will be endurable even for a dog.

Science News-Letter, August 11, 1928

Hoof and Mouth Serum

Bacteriology

Hoof and mouth disease in cattle is being combated with serum in Germany. Since the disease has become thoroughly established in Europe the drastic eradication measures resorted to in the United States are out of the question, and preventive and curative treatment applied to animals exposed to the infection are the only practical means open. Officials of the Province of Brandenburg are much encouraged by the results so far achieved.

The serum is prepared from animals which have been made immune to the disease by constantly increasing doses of the virus. It is carefully tested before delivery, and is good for at least one year.

Inoculation is practiced in three ways. The first is a protective inoculation which is only temporary in its effect, rendering the animals immune for only about ten days. This treatment is given to animals when protection is desired against the danger of infection for a limited time, as at cattle markets or fairs.

The second type of inoculation is that given to cattle simultaneously with an artificial infection of the disease virus itself. The immune serum must be administered in the very earliest stages of the animal's reaction to the infection, before any other symptom than a slight fever has manifested itself.

Finally, a curative inoculation is given to cattle that have contracted the disease, if it has not yet reached an advanced stage. This curative inoculation is commonly one-third heavier than the preventive ones. Satisfactory results are reported when inoculation is given during the earlier stages of the disease, but cases in which inflammation of the heart muscles has set in are usually regarded as incurable.

As a result of this experience, it seems evident, said Dr. Halpern, that goat serum gives efficient protection in a large number of cases and offers the advantage of being more readily available than human convalescent serum, which has seen considerable application for the same purpose, since it can be produced in quantities to meet all necessary demands.

Science News-Letter, August 11, 1928

Of the 740,000 oil wells which have been drilled in the United States in the past 69 years, 319,000 are still producing.

Science and Engineering

Engineering

L. A. HAWKINS, at the annual convention of the National Electric Light Association:

I shall waste no time in demonstrating the relationship between science and engineering which is implied in the title of this paper. That engineering springs from scientific discovery, even as the oak from the acorn, would be easy to demonstrate, but I am sure the proof before this audience would be superfluous.

No other great industry has so explicitly recognized its indebtedness to science as has the electrical industry in its selection of its nomenclature. The electrical engineer in his daily speech pays constant tribute to those humble and widely scattered workers in science who laid the foundations of his art. When he expresses in words the most fundamental of electrical relations, he commemorates the achievements of the French Ampere, the Italian Volta, and the German Ohm. When he deals with alternating current circuits, with inductance and capacity, he pays oral homage to the great American pioneer, Joseph Henry, and to the English Faraday, the greatest of them all. In the names of his magnetic units he has recognized the contributions of Gauss in Germany, Oersted in Denmark, and Maxwell in England.

Such recognition is indeed fitting. The great electrical industry had its origin in the patient experiments conducted by these pioneers in their small and ill-equipped early laboratories.

With the work of Maxwell and Hertz in the '80's, more than forty years ago, which developed and demonstrated the electromagnetic theory, and showed that light, radiant heat and electricity are identical in nature, differing only in wave length, the physics of electricity seemed complete. It seemed probable that all the great discoveries had been made. The electrical industry had begun, basing its engineering on existing scientific knowledge, and on that original basis it has developed for the ensuing forty years, finding it a wholly adequate foundation for its tremendous growth. In the development of some of the devices now utilizing electric power, such as X-ray and radio tubes, new physical principles were involved, but the generation, transmission and distribution of electrical energy are still resting solely on the physics of Maxwell's day.

Does this mean that since then there have been no important advances in physical science? Quite the contrary. I think all physicists will agree that more important physical discoveries have been made in the past generation than in all the previous history of the human race. "Revolution" is a word much overworked by advertisers, but it is literally descriptive of what has happened to physics in the past thirty-two years. The most firmly established truths of thirty-two years ago have been overthrown or profoundly altered. Things which then definitely were accepted as forever unknowable have had their true nature revealed and have become the foundations of our new knowledge.

A generation ago science accepted the boundaries of our stellar universe in the direction of the infinitely great, and the boundaries of the atom in the direction of the infinitely small, as permanent limits to human knowledge. Today astronomers know that our universe with all its millions of stars is only one of myriad similar universes separated from us and from each other by inconceivable distances measurable only in millions of light years, while physicists know that the atom is a miniature planetary system composed of electrons moving at enormous velocities in tiny orbits around a central positive nucleus.

Thirty-two years ago among the basic principles of science were the conservation of matter and energy, the immutability of the elements, the wave theory of radiant energy, the indivisibility of the atom, and the universality of the Newtonian dynamics. All of these principles have been greatly modified or definitely overthrown. Matter and energy are not separate entities, each fixed in amount through eternity. On the contrary, what we call matter may radiate itself away in the form of energy, and probably in the last analysis matter and energy are one.

Science News-Letter, August 11, 1928

A recent investigation shows that girls of practically all ages spend more time than boys in reading books for amusement.

Government's Need of Science

Sociology

DEXTER S. KIMBALL, before the annual meeting of the American Engineering Council:

Autocratic government orders things much more efficiently because it can call to its aid, if it will, the special skill and knowledge necessary for the solution of these problems. But it is better to be poorly self-governed than it is to be well governed in an arbitrary manner. The outstanding problem of democracy therefore is to call to its aid the groups of specially trained men who can assist in these matters. At the present time the tendency in government appears to be toward government by special interests or "Blocs." Thus we hear much of the organized farmers, the merchants' bureaus, the lumber interests, the bankers, and so on. The influence of these groups, it is true, is indirect, but it is often effective. Thus at the present moment a congressional committee is holding hearings on tax reduction surrounded by groups of appellants, each clamoring for relief from taxation for the bloc it represents. The committee sitting like a jury will endeavor to evaluate the evidence and decide what to do. May Heaven help them and send them wisdom, for theirs is a difficult situation. Trying a man for murder is a much simpler jury affair.

Perhaps the most disheartening aspect of the situation is the widespread indifference of people at large to these changed conditions. The average citizen is pleased to enjoy the comforts of life that modern methods have brought to him, but apparently does not give much thought to the difficult social and economic changes that appear to be inseparably connected with the production of these comforts. Or if he belongs to the older school of thought he deplores the decadent age and mourns for the "good old days" that existed somewhere in the dim past, just where, no one knows.

Science News-Letter, August 11, 1928

FIRST GLANCES AT NEW BOOKS

CLINICAL AND ABNORMAL PSYCHOLOGY—J. E. Wallace Wallin—*Houghton Mifflin* ($3). A number of books on abnormal psychology have appeared recently, most of them addressed to a particular audience. This comprehensive and practical text deals with problems of children, and is designed for the use of teachers, nurses, welfare workers, and child specialists of various sorts. Dr. Wallin, who has been studying abnormal children for seventeen years, knows the sort of information that teachers and psychologists want along this line, and he provides a real guidebook on such matters as psychological clinical examinations, mental tests, disorders of the senses. Considerable history of mental tests and psychological examinations is presented, so that the reader may understand the scientific status and the scope of usefulness of the materials at his command.

Psychiatry
Science News-Letter, August 11, 1928

THE NEW CRIMINOLOGY—Dr. Max Schlapp and Edward H. Smith—*Boni and Liveright* ($4). Crime considered as disease or defectiveness. Emphasis is laid on the new glandular theory of crime. The plans suggested for renovation of present legal and judicial procedures are interesting, radical, but the authors themselves admit they might not work out well. The illustrations are all related to glandular disturbances.

Criminology
Science News-Letter, August 11, 1928

ADULT LEARNING — Edward L. Thorndike—*Macmillan* ($3). There is more truth in the saying "Never too old to learn" than in William James' pessimistic view that a man's mental grooves are firmly set before 25. This careful study shows that adults from 25 to 45 can learn at nearly the same rate that they would have learned at 15 or 20 years. Aside from presenting results of the first extensive experiments on the learning abilities of various types of adults—college bred, prisoners, adults in secretarial schools, the bright and the dull—the study will be of value to those who teach adults in night classes or in occupational training schools; for Dr. Thorndike discusses the possibilities and the handicaps of adult education in the light of his new findings.

Psychology—Education
Science News-Letter, August 11, 1928

A CATHOLIC VIEW OF HOLISM—F. C. Kolbe—*Macmillan* ($1.25). Monsignor Kolbe's critique of General Smuts' *Holism and Evolution* shows how the views there set forth coincide in many respects with the evolutionary philosophy of the Catholic Church, as formulated by St. Augustine and St. Basil and confirmed by St. Thomas of Aquin. The book comes well approved from two sides: there is a friendly foreword by General Smuts, and the imprimatur is of Cardinal Hayes.

Evolution
Science News-Letter, August 11, 1928

THE DAY AFTER TOMORROW—Philip Gibbs — *Doubleday, Doran* ($2.50). The veteran journalist of the Great War takes his turn as prophet and forecasts the effect of science on civilization, with particular reference to sources of power and medical experiments in rejuvenation. He considers the chief obstacle on the road to a scientific Utopia to be the perils of modern scientific warfare.

Sociology
Science News-Letter, August 11, 1928

PREVENTIVE AND CORRECTIVE PHYSICAL EDUCATION—George T. Stafford—*Barnes* ($3). Well written text for teachers of physical education, emphasizing the need of the many who are neither great athletes nor cripples. Good chapters on athletic injuries and physiotherapy. Cooperation with medical science is stressed.

Hygiene—Physical Education
Science News-Letter, August 11, 1928

CORRECTIVE PHYSICAL EDUCATION FOR GROUPS—Charles Leroy Lowman, Claire Colestock and Hazel Cooper—*Barnes* ($4.50). Besides the numerous corrective exercises that may be used individually or in classes, this book gives many games and dances and a few short plays which will be exceedingly helpful to the teacher in the difficult task of making corrective physical exercises interesting. The work is the result of many years' experience in Los Angeles county and city schools and Dr. Lowman's orthopedic practice.

Hygiene—Physical Education
Science News-Letter, August 11, 1928

GEOLOGY—A. P. Brigham and F. A. Burt—*Am. Book Co.* ($3). A well developed, solidly written textbook of geology.

Geology
Science News-Letter, August 11, 1928

OH, RANGER!—H. M. Albright and F. J. Taylor—*Stanford University Press* ($2.50). "Oh, Ranger!" These two words open ninety per cent. of all conversations in our national parks. The next sentence always ends with a question mark. The Great American Traveler wants to know. And herein, from Superintendent Albright of Yellowstone and from Mr. Taylor, a news gatherer long acquainted with various of our parks, he receives information. The book is packed with meat, most cheerfully sauced with anecdotes and appetizingly garnished with clever little black-and-white sketches.

Natural History
Science News-Letter, August 11, 1928

THE ELASMOBRANCH FISHES—J. Frank Daniel—*University of California Press* ($5.50). Prof. Daniel has long been known to all zoologists as one who speaks with authority on the subject of the sharks and their relatives. Here he again places his colleagues in his debt by the issuance of a completely revised new edition of his classic on the anatomy of the elasmobranchs. *Heptanchus maculatus* is used as a type animal throughout.

Anatomy
Science News-Letter, August 11, 1928

FORTY-SECOND ANNUAL REPORT OF THE BUREAU OF AMERICAN ETHNOLOGY—*Government Printing Office* ($2.75). Three papers by John R. Swanton and one by William E. Myer on Indian trails of the southeast make up the bulk of this large volume. Dr. Swanton's study of the religious beliefs and medical practices of the Creeks is particularly interesting, though all of the papers contain much valuable data on the vanishing Indian culture.

Ethnology
Science News-Letter, August 11, 1928

BUILDING SCIENCE ABSTRACTS—British Department of Scientific and Industrial Research—*H. M. Stationery Office, London* (9d). The first issue of a new periodical compiled by England's Building Research Station. Articles published in all parts of the world on concrete, stone, metal, paint, housing and other related subjects are summarized.

Engineering
Science News-Letter, August 11, 1928

A Statement of Purpose

(The aims, ideals and aspirations of an institution)

SCIENCE SERVICE is a unique institution, established at Washington for the purpose of disseminating scientific information to the public. It aims to act as a sort of liaison agency between scientific circles and the world at large. It interprets original research and reports the meetings of learned societies in a way to enlighten the layman. The specialist is likewise a layman in every science except his own and he, too, needs to have new things explained to him in non-technical language. Scientific progress is so rapid and revolutionary nowadays that no one can keep up with it from what he learned at school. Science Service endeavors to provide life-continuation courses in all the sciences for newspaper readers anywhere in America without tuition fees or entrance examinations.

In a democracy like ours it is particularly important that the people as a whole should so far as possible understand the aims and achievements of modern science, not only because of the value of such knowledge to themselves but because research directly or indirectly depends upon popular appreciation of its methods. In fact the success of democratic institutions, as well as the prosperity of the individual, may be said to depend upon the ability of people to distinguish between science and fakes, between the genuine expert and the pretender.

Science Service spares no pains or expense in the endeavor (1) to get the best possible quality of popular science writing and (2) to get it to the largest possible number of readers. If in doing this it can make both ends meet, so much the better. If not, it will do it anyway.

Through the generosity of E. W. Scripps, Science Service has been assured of such financial support as to insure its independence and permanence. Mr. Scripps's long and wide experience as a newspaper editor and proprietor had convinced him of the importance of scientific research as the foundation of the prosperity of the nation and as guide to sound thinking and living and he realized the need for an independent agency that would bring the results of research to the attention of the entire people so these could be applied to the solution of their personal, social or political problems.

Science Service is chartered as a non-profit-making institution and all receipts from articles, books, lectures and films are devoted to opening up new avenues for the diffusion of knowledge and developing promising methods of popular education. Although Science Service has a philanthropic purpose, it is conducted on business principles, with the aim of making each branch of its activities ultimately self-supporting so far as possible. All acceptable contributions are paid for and all published articles are charged for.

Science Service is under the control of a Board of Trustees composed of ten scientists and five journalists. The leading national organizations of all the sciences, the National Academy of Sciences, the National Research Council, and the American Association for the Advancement of Science, appoint three trustees each.

Science Service occupies offices in the magnificent new building of the National Academy of Sciences and the National Research Council on Potomac Park opposite the Lincoln Memorial.

This strategic situation enables the Service to keep constantly in touch with the progress of the sciences because new inventions and discoveries are promptly put on exhibition in the building, and the Council brings together investigators in the various sciences and leaders in engineering and industry from all parts of the country.

Science Service is not a governmental institution, but it is in close contact with the numerous governmental bureaus of research. It is not under the control of any clique, class or commercial interest. It is not the organ of any single scientific association. It serves all the sciences. It engages in no propaganda, unless it be called propaganda to urge the value of research and the usefulness of science.

Science Service began its work on January 1, 1921, and has now a sizable office staff with a large corps of contributors in the chief research institutions of this country and Europe.